



# Idaho Power

## RAPID RIVER HATCHERY

1987 Chinook Brood Year Report



by

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## ABSTRACT

The Rapid River adult trap was in operation from April 14 through September 15, 1987. During this time, 3,808 spring chinook were collected. This total was comprised of 3,598 adults and 210 jacks. Summer chinook totaling 68 and adult steelhead totaling 76 were also counted during this time. Hells Canyon spring chinook totaling 534 adults and 2 jacks were transported to Rapid River Hatchery during 1987 for spawning.

Overall prespawning mortality averaged 30% during 1987. Spawning operations began on August 13 and continued through September 11, 1987. A total of 1,310 females were spawned, yielding approximately 5.6 million eggs. Survival to eye-up and swim-up was 91.38% and 89.51%, respectively.

A total of 5.0 million swim-up fry were transferred to the raceways for early rearing. Surplus fingerlings totaling nearly 1.7 million were outplanted to the Clearwater and Salmon River drainages.

Final rearing produced a smolt plant of 2.3 million to Rapid River and .5 million to the Snake River below Hells Canyon Dam. Prior to smolt release, nearly 330,000 fish were coded wire-tagged.

A total of 212,703 pounds of feed was used to produce 138,119 pounds of fish, for an overall feed conversion of 1.54. Feed costs were \$88,929.58, which resulted in a cost of \$0.646 per pound of production.

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## INTRODUCTION

Rapid River Hatchery was constructed in 1964 by Idaho Power Company (IPC) as compensation for losses of chinook salmon Onchorhynchus tshawytscha resulting from the construction of Brownlee, Oxbow, and Hells Canyon dams on the Snake River. This mitigation, as required by the Federal Energy Regulatory Commission, required that IPC transplant this run of chinook from the Snake River to the Salmon River drainage and provide funds for the production of 3 million spring chinook smolts annually. These fish are for release into Rapid River and the Snake River below Hells Canyon Dam.

## LOCATION

Rapid River Hatchery is located in Idaho County, approximately 7 miles (11.2 km) southwest of the community of Riggins, Idaho, on Rapid River, a tributary of the Little Salmon River. Rapid River Hatchery is staffed and operated by the Idaho Department of Fish and Game (IDFG) and completely funded by IPC.

## OBJECTIVES

The objectives of Rapid River Hatchery are:

1. To produce 3 million spring chinook smolts at an average size of approximately 20 per pound (44.1 per kg) for release into Rapid River and the Snake River below Hells Canyon Dam.
2. To trap and spawn adult salmon returning to Rapid River.
3. To evaluate various strategies and techniques for rearing spring chinook salmon.
4. To provide eggs and/or fry for supplementation purposes.

## FISH REARING/HOLDING FACILITIES

The fish rearing facilities at Rapid River Hatchery consist of 48 double stack Heath incubator trays, 12 outdoor concrete raceways (6 ft x 90 ft; 1.82 m x 27.3 m), and two earthen rearing ponds with concrete side walls. One concrete adult holding pond (80 ft x 25 ft; 24.3 m x 7.6 m) and two earthen holding ponds provide space for holding up to 10,000 adult salmon for spawning. (Table 1 and 2).

Table 1. Rapid River Hatchery production capacity data.

<u>Rearing/holding area</u>	<u>Volume</u>	<u>Carrying capacity</u>
Heath incubators	768 Trays	7.7 million eggs
Raceways (12)	1,890 cu ft ea	500,000 fry ea
Rearing Pond No. 1	57,600 cu ft	1 million smolts
Rearing Pond No. 2	82,000 cu ft	2 million smolts
Adult Pond No. 1	12,000 cu ft	1,000 adults
Adult Pond No. 2	24,000 cu ft	3,000 adults
Adult Pond No. 3	80,000 cu ft	6,000 adults

Table 2. Rapid River rearing/holding area volumes.

<u>Rearing/holding area</u>	<u>Volume</u>
Rearing Pond 1A	28,800 cu ft
Rearing Pond No. 1B	28,800 cu ft
Rearing Pond 2A	21,700 cu ft
Rearing Pond 2B	19,300 cu ft
Rearing Pond 2C	19,300 cu ft
Rearing Pond 2D	21,700 cu ft
Adult Pond No.	12,000 cu ft
Adult Pond No.	24,000 cu ft
Adult Pond No.	80,000 cu ft
3	

The adult trapping facility, located on Rapid River approximately 1.5 miles (2.4 km) downstream from the hatchery, is equipped with a permanent wooden velocity barrier, a three-step fish ladder, and a two-stage trap. Adult salmon are transferred from the trap to a 1,000-gallon tank truck for transport to the hatchery by means of an Alaska Steep Pass ladder and a 500-gallon bucket operated by an overhead hoist.

#### WATER SUPPLY

From its origin in Adams County, Rapid River flows through a pristine canyon before reaching the hatchery. Under inclusion in the Wild and Scenic Rivers Act, the Rapid River drainage has not been subject to perturbations, such as logging and road building, and consequently provides an excellent water source for rearing chinook. Water quality parameters are listed in Table 3.



Table 3. Water quality analysis, Rapid River, March 1989.

Parameter	Suggested range	Observed level
Alkalinity as CaCO <sub>3</sub>	10 - 400	62.0
Dissolved Oxygen	5.0 - saturation	13.0
Ammonia (NH <sub>3</sub> )	<0.0125	0.003
pH	6.5 - 8.0	7.3
Total Hardness as CaCO <sub>3</sub>	10 - 400	74.0

Hatchery water is obtained through one 30-inch (76.2 cm) and one 24-inch (61 cm) pipeline. A 5-foot (1.5 m) high wooden diversion dam provides the necessary hydraulic head to supply the hatchery with approximately 30 cubic feet per second (cfs) of water. Except for the incubators, all systems operate on gravitational flow. Water for the incubation system is pumped from the headrace by one of two 7.5-horsepower electric pumps. A gasoline-operated backup pump and a filter bed system provide water during electrical failures.

#### STAFFING

The permanent hatchery staff consists of a Hatchery Superintendent III, a Hatchery Superintendent I, and a Fish Culturist. Approximately five seasonal employees are hired each year from February through November. The summer Youth Employee Training Program also provides one or two employees to assist with grounds maintenance, etc. Housing accommodations include three residences for the permanent staff and a mobile home for seasonal employees.

#### ADULT COLLECTION

##### Spring Chinook Returns To Rapid River

The adult trapping facility was in operation from April 14 through September 15, 1987. Spring chinook totalling 3,808 (3,598 adults and 210 jacks) were collected between May 4 and July 27, with the peak of the run occurring May 16-31 (Figure 1).

The sex ratio of the run showed 1,807 adult males, 1,791 females and 210 jacks. Age class composition, determined by fork length measurement (Figure 2), indicated 210 (5.5%) three year olds, 2,443 (64.2%) four year olds, and 1,155 (30.3%) five year olds.

All spring chinook, including jacks, were given a single, subcutaneous injection of water soluble, Erythromycin Phosphate, at the rate of 5 mg Act. Erythromycin per pound of fish. Powdered, 80% ACt. Erythromycin Phosphate was

# BY 87 Run Timing

Rapid River Hatchery

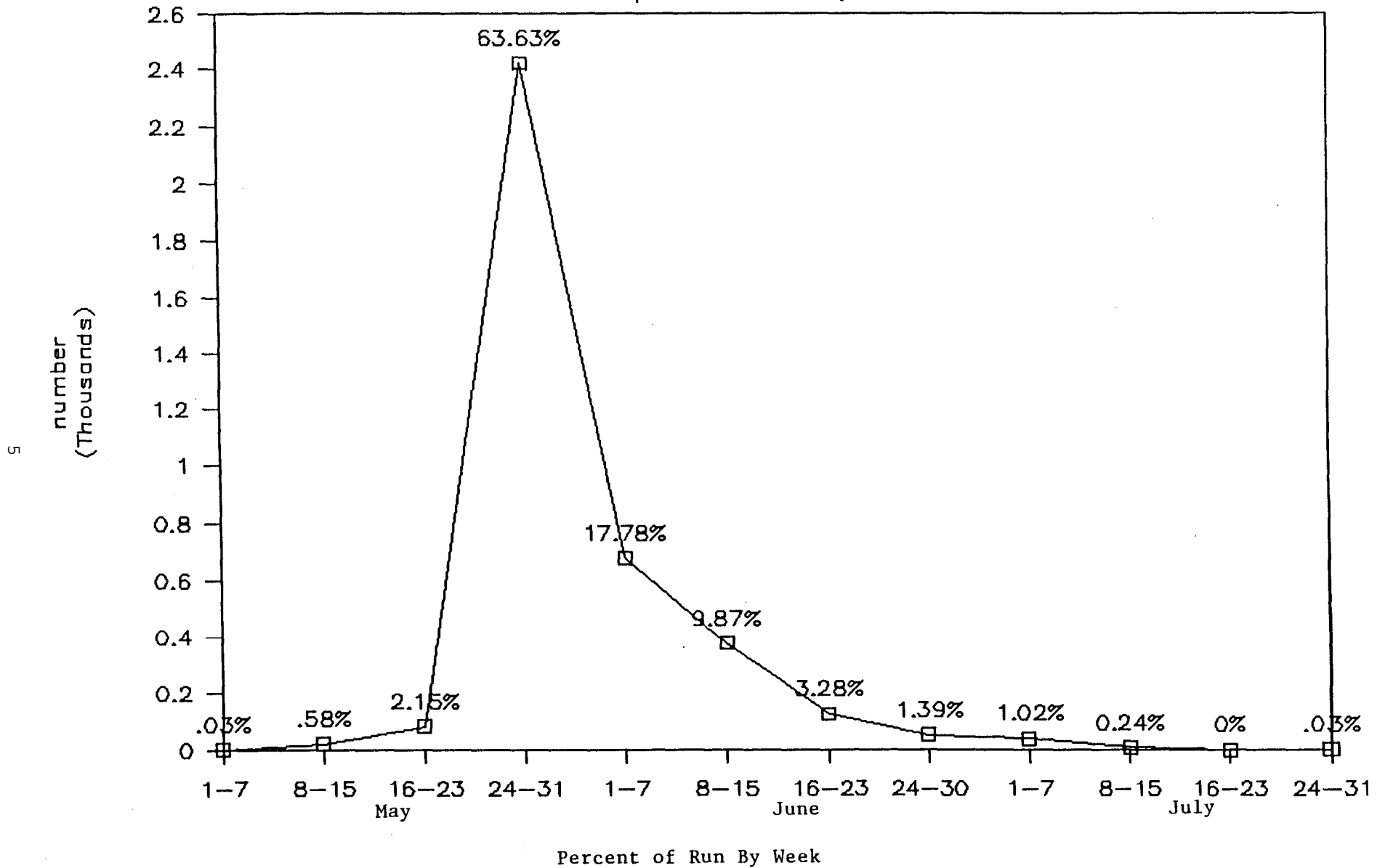


Figure 1. Run timing of 1987 adult chinook to the Rapid River trap.

# Rapid River Spring Chinook

Length Frequencies 1987

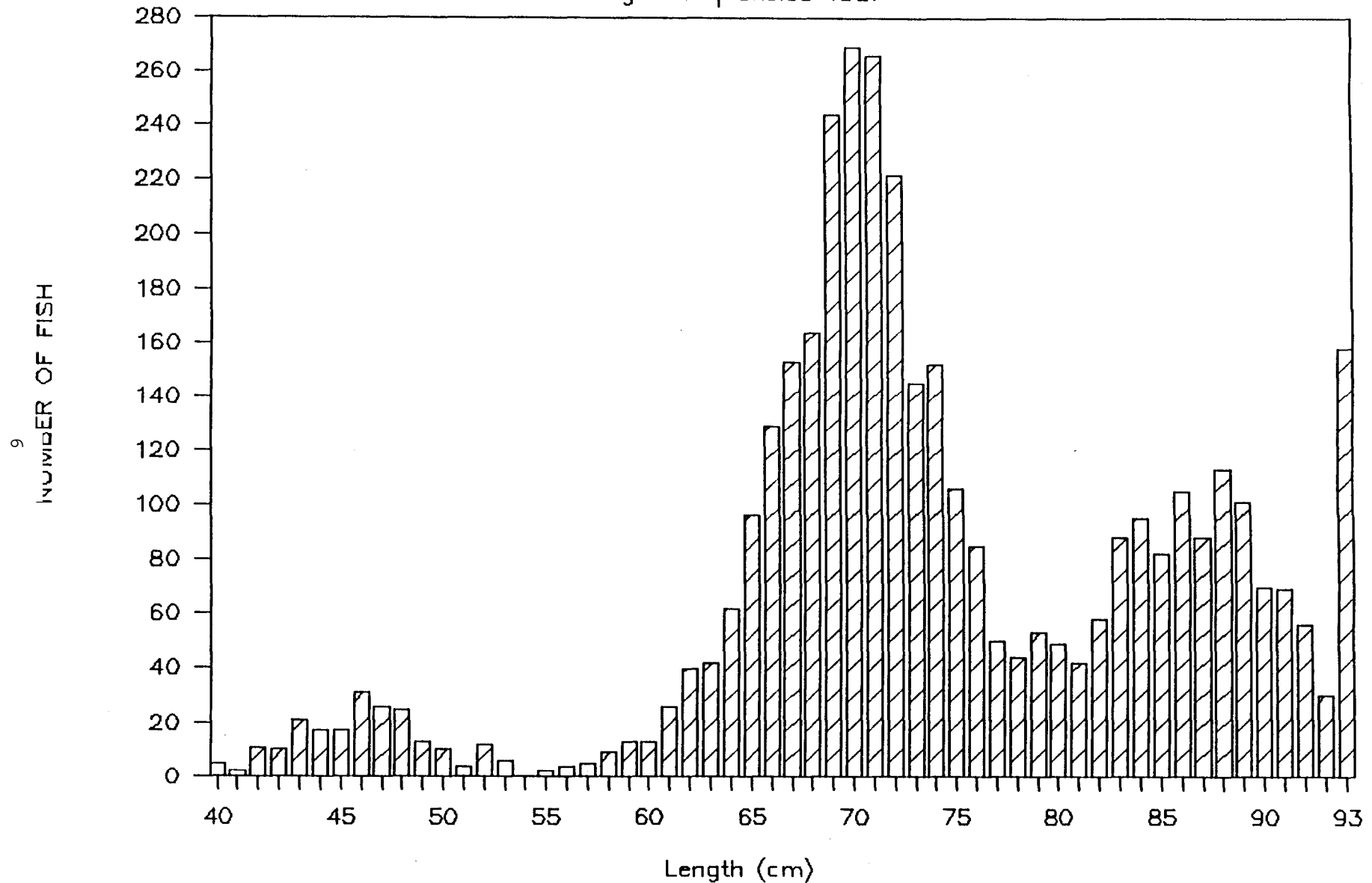


Figure 2. Spring chinook length frequencies.



used this year to make the injectable stock solution. All spring chinook were transported to the hatchery after being injected, checked for injuries, and measured to the nearest cm. fork length.

Throughout the trapping period, injuries totaling 842 were documented. These injuries were comprised of 126 gaff wounds, 258 nitrogen burns, 247 gill net scars and 211 injuries of unknown origin. Trapping/handling mortalities totaled 8 adults this year.

A total of 204 "Ad-Clipped" spring chinook were observed this season at the trap facility. This total was comprised of 66 three year olds, 131 four year olds and 7 five year olds. These fish were part of the U.S./Canada agreement to determine Idaho's contribution to the ocean harvest.

### Hells Canyon Spring Chinook

Spring chinook totaling 536 (534 adults and 2 jacks) were transferred to Rapid River Hatchery from the IPC, Oxbow/Hells Canyon project from May 13 through June 26, 1990. This number was comprised of 284 adult males, 250 females and 2 jacks. During this time, only one fish died as a result of transportation.

Other specific data pertaining to run timing, injuries, length frequency, etc. is available in the annual report from Oxbow Hatchery.

### Inventory Of Miscellaneous Species

Summer chinook totaling 61 adults and 7 jacks were observed from July 16 through September 3, 1987 (Table 4). This total was comprised of 28 adult males, 33 females, and 7 jacks. All summer chinook were transported from the trap facility to the Rapid River release site adjacent to the hatchery complex. No measurements were taken this year on the summer chinook adults.

Table 4. Inventory of miscellaneous species.

Species	Number trapped
Summer Chinook *	68
Steelhead **	74
Bull Trout	128

\* No length frequency data available.

\*\* Specific data listed in Table 5.

Other species trapped this season included 128 bull trout Salvelinus confluentus and 74 adult steelhead Oncorhynchus mykiss (Table 4). The steelhead count was comprised of 4 males and 2 females of hatchery origin and 18 males and 50 females of wild/natural origin (Table 5). All hatchery fish were transported to the Little Salmon River and released approximately one mile above the confluence of Rapid River. All wild/natural steelhead were transported and released back into Rapid River adjacent to the hatchery complex. Steelhead length frequency data is listed in Table 5.

#### **HARVEST DATA/SPORT AND INDIAN FISHERY**

During 1987, an estimated 422 spring chinook adults were harvested by the sport fishery on the Little Salmon River. Harvest data reported by the Nez Perce tribe, indicated an additional 2,430 fish were taken by the indian fishery.

#### **PRESPAWNING MORTALITY**

All Rapid River spring chinook were held in the HP-2 system this year. Prespawning mortality totaled 1,166 (30.6%) which included 545 adult males, and 621 females.

Prespawning mortality on the Hells Canyon chinook was 156 (29.1%), which included 83 adult males and 73 females. These fish were kept separate this year in the HP-1 system.

Throughout the holding period, total prespawning mortality for both Rapid River and Hells Canyon adult chinook was exceptionally high (30.4% ave.). This was attributed primarily to fungus, as a result of delays in authorization to use malachite green as a fungicide. Treatments with malachite green at the rate of 1 ppm, three days per week, were initiated on all pond systems by June 15, 1987. Mortalities due to bacterial kidney disease (BKD) accounted for only 1.5% of the total mortality.

#### **CHINOOK SPAWNING**

##### **Rapid River Adults**

Spawning operations began on August 13 and continued two days per week through September 11, 1987. During this time, 1,133 females were spawned to produce approximately 4,961,765 eggs, at an average eye-up of 91.68% (Table 6). A total of 33 females were destroyed prior to spawning due to poor egg quality, bloody ovarian fluid, symptoms of BKD, etc.

Spawning procedures for 1987 included placing eggs from two females into a colander to drain off the ovarian fluid. The eggs were then transferred to a bucket, fertilized with milt from two males, and mixed with approximately one

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Table 5. Rapid River adult steelhead length frequency for 1987.

Length (cm)	Hatchery origin		Wild origin	
	Males	Females	males	
56		1		
57				
58	1	1	1	1
59				
60				
61			3	3
62			1	
63			2	
64	3		6	1
65				2
66			2	3
67				
68				
69				1
70				1
71				7
72				
73				
74				6
75				
76				6
77				1
78				
79				13
80				
81			1	4
82				1
83				
84			1	
85				
86				
87				
88				
89			1	
90				
Totals	4	2	18	50

TAB5

TABLE 6. Egg take information for Brood Year 1987.

RAPID RIVER STOCK								
LOT NUMBER	DATE SPAWNED	NUMBER OF FEMALES	NET EGG NUMBERS	AVERAGE EGGS PER FEMALE	NUMBER EYED EGGS	PERCENT EYE-UP	SECONDARY PICKOFF	EGGS/FRY REMAINING
R-1	08/13/87	3	10,746	3582.0	9,181	85.44	85	9,096
R-2	08/14/87	7	33,016	4716.6	28,712	86.96	195	28,517
R-3	08/17/87	4	20,210	5052.5	18,768	92.86	100	18,668
R-4	08/18/87	30	140,840	4694.7	122,292	86.83	2,000	120,292
R-5	08/20/87	20	93,794	4689.7	88,928	94.81	1,250	87,678
R-6	08/21/87	126	567,554	4504.4	532,639	93.85	11,300	521,339
R-7	08/27/87	36	171,251	4757.0	153,115	89.41	1,591	151,524
R-8	08/28/87	184	839,512	4562.6	771,441	91.89	23,182	748,259
R-9	08/27/87	43	198,742	4621.9	179,869	90.50	2,273	177,596
R-10	08/28/87	168	724,335	4311.5	669,604	92.44	9,091	660,513
R-11	09/01/87	303	1,278,626	4219.9	1,174,345	91.84	22,727	1,151,618
R-12	09/04/87	149	611,994	4107.3	557,029	91.02	12,273	544,756
R-13	09/08/87	51	238,492	4676.3	212,574	89.13	2,273	210,301
R-14	09/11/87	9	32,653	3628.1	30,658	93.89	100	30,558
TOTALS		1,133	4,961,765	4379.3	4,549,155	91.68	88,440	4,460,715
NUMBER FEMALES SPAWNED: 1,133								
AVE. NO. EGGS/FEMALE = 4,379.3								
AVE. EYE-UP PERCENT = 91.68%								

HELLS CANYON STOCK								
LOT NUMBER	DATE SPAWNED	NUMBER OF FEMALES	NET EGG NUMBERS	AVERAGE EGGS PER FEMALE	NUMBER EYED EGGS	PERCENT EYE-UP	SECONDARY PICKOFF	EGGS/FRY REMAINING
HC-1	08/13/87	2	11,711	5855.5	6,306	53.85	85	6,221
HC-2	08/17/87	3	10,714	3571.3	10,084	94.12	60	10,024
HC-3	08/20/87	11	49,747	4522.5	40,281	80.97	1,957	38,324
HC-4	08/24/87	49	225,161	4595.1	196,646	87.34	5,000	191,646
HC-5	08/27/87	39	144,074	3694.2	132,223	91.77	5,455	126,768
HC-6	08/31/87	35	131,766	3764.7	122,782	93.18	2,273	120,509
HC-7	09/04/87	38	121,207	3189.7	111,149	91.70	2,273	108,876
TOTALS		177	694,380	3923.1	619,471	89.21	17,103	602,368
NUMBER FEMALES SPAWNED: 177								
AVE. NO. EGGS/FEMALE = 3,923.1								
AVE. EYE-UP PERCENT = 89.21%								



cup of well water to activate the sperm. A random selection of jacks, representing 1 to 2 percent of the males, were used this year to fertilize the eggs. Each bucket of eggs were then water hardened for 30 minutes in a 200 ppm stock solution of buffered, Argentyne. Heath, vertical stack incubators were then used for incubation.

### Hells Canyon Adults

During 1987, 177 Hells Canyon females were spawned to produce approximately 694,380 eggs, at an average eye-up of 89.21% (Table 6). Throughout the holding period, there was no appreciable difference in mortality between the Rapid River or Hells Canyon adults. Spawning procedures were followed in the same manner as mentioned above under "Rapid River Adults".

### CARCASS DISPOSITION

During 1987, all non-salvageable carcasses from spawning and daily mortalities were collected twice a week and hauled to a landfill near Grangeville, Idaho by the Walco Company. Salvageable, trapping mortalities totaling 8, were given to the Riggins Food Bank on 9/17/87.

Also during the spawning operation, snouts were collected from all "Ad-Clipped" chinook and sent to the Lewiston Lab for tag recovery.

### EGG INCUBATION

Beginning on the fourth day of incubation, all egg lots were treated with formalin to control fungal development. Treatments were administered three times per week at a 1:600 concentration for 15 minutes and were continued until each egg lot accumulated 800 temperature units (TU's).

Eye-up occurred at approximately 500 TU's, at which time all eggs were shocked and picked using the salt flotation method. The volumetric displacement method was then used to calculate egg size and numbers (Table 6).

Hatching occurred at approximately 1,000 TU's at which time all egg lots were "secondary" picked. All swim-up fry were transferred to the early rearing raceways at 1700 to 1900 TU's. **Survival** from eyed eggs to swim-up fry averaged 98.1% for Rapid River stock, and 97.2% for the Hells Canyon stock (Table 7).

Table 7. Survival from green eggs to swim-up fry, Brood Year 1987.

<u>Rapid River and Hells Cannon stock combined</u>				
<u>Eggs Taken</u>	<u>Eyed Eggs</u>	<u>% Eye-up</u>	<u>Swim-up fry</u>	<u>% Survival to Swim-up</u>
5,656,145	5,168,626	91.38	5,063,083	89.51

## FISH PRODUCTION

### Early Rearing

During the period January 12 through March 9, 1988, a total of 5,063,083 swim-up fry (Table 7) were transferred to the raceways. Average size at the time of transfer was 1,307.5 fish per pound. Hells Canyon fry were placed in two raceways with some mixing of Rapid River fry in the second raceway. Loading densities ranged from 298,000 to 472,000 fish per raceway, with an initial water depth of 1.5 ft. and water inflow of 0.9 cfs. As fish size increased, water depth and inflow were adjusted to a maximum depth of 3 ft. and 1.5 cfs flow. Density and flow indices were kept at or below 0.5 and 1.5 respectively throughout the initial rearing period. Fry size increased to an average size of 2.47 inches, for a conversion of 0.92 during initial rearing. Both Moore Clark and BioProducts feed was used during initial rearing.

### Final Rearing

Brood Year 1987 fingerlings, totaling nearly 3.2 million, were transferred from the raceways to the final rearing ponds from May 11 through June 4, 1986. Initial pond loadings are presented in Table 8.

Table 8. Initial pond loading densities, June, 1988.

Pond	Inflow	Millions of fish	Size per pound	Density index	Flow index
1	14.6 cfs	1.5	102.0	.07	.73
2A	8.2 cfs	.6	168.0	.05	.37
2B	N.A.	N.A.	N.A.	N.A.	N.A.
2C	8.2 cfs	.5	112.0	.06	.40
2D	8.2 cfs	.6	172.0	.05	.36

Prior to ponding in early May, work was completed on a concrete headrace system for rearing pond number two. This new "design" increased the water turnover rate by 35%, and produced a more uniform flow pattern, thus eliminating waste build-up in the upper areas of the pond. Specific data regarding this pond modification is listed in the "Fish Health" section of this report.

Surplus fingerlings totaling approximately 1.7 million were distributed to various plant sites from May 4 through June 14, 1988.

During final rearing, both Moore Clark and BioProducts feed was used to compare mortalities in the pond two system (see Fish Health section). Overall, BioProducts feed performed better, resulting in better fish growth, feed

conversion, and reduced mortality. After November 1, 1988, all fish were fed the BioProducts diet.

### Feed Cost and Performance

A total of 212,703 pounds of feed was used during the 1987 Brood Year. This total was comprised of 29,782 pounds of Moore Clark feed and 182,921 pounds of BioProducts feed. Specific feed use data is listed in the "Fish Health" section of this report. Total feed cost was \$88,535.42, resulting in a cost per pound of fish produced of \$0.64. The brood year feed conversion was 1.54.

## FISH HEALTH

### Bacterial Kidney Disease

In recent years, bacterial kidney disease has not been a major problem at Rapid River Hatchery, although during routine necropsies, minor levels of Renibacterium salmoninarum have been detected. This was especially evident at the end of October, 1988 after completion of the coded wire tagging project (Figure 3). All tagged fish, nearly 340,000, were placed in empty pond section 2A from October 17 through November 1, 1988. Throughout the following months, routine necropsies revealed a much higher incidence of BKD in the tagged fish group versus the untagged group (Figure 3).

Although no erythromycin medicated feed was fed to Brood Year 1987 fish prior to the tagging project, it is quite evident that a 21 day erythromycin treatment should have been done. It is anticipated that future brood year fish will have at least two medicated feed treatments during the rearing cycle. Total mortality due to BKD was approximately 10,000 fish during the brood year.

### Erythrocytic Inclusion Body Syndrome

Prior to ponding the Brood Year 1987 fingerlings, minimal numbers of fish with "white tails" were visible in the raceways being fed the Moore Clark diet. These fish were transferred to Pond 2A, while similar numbers being fed BioProducts feed were transferred to Pond 2D by June 4, 1988. This feeding regime was followed until November 1, 1988, at which time the Pond 2A group was switched to BioProducts feed.

By late September, a higher incidence of "white tails" were visible in Pond 2A and through routine necropsies, it was noted that Erythrocyte Inclusion Body Syndrome (EIBS) was very evident in this system. Within the following month, mortalities nearly doubled on the Pond 2A group of fish being fed the Moore Clark diet (Figure 4).

It was noted that while EIBS was found in all rearing pond areas, only the Moore Clark fish group suffered excessive mortality. On October 6, a formalin

# RAPID RIVER HATCHERY – POND 2 MORTALITY

POND 2A FISH ARE ALL TAGGED &/OR BRANDS

POND  
2A  
FISH  
ARE  
ALL

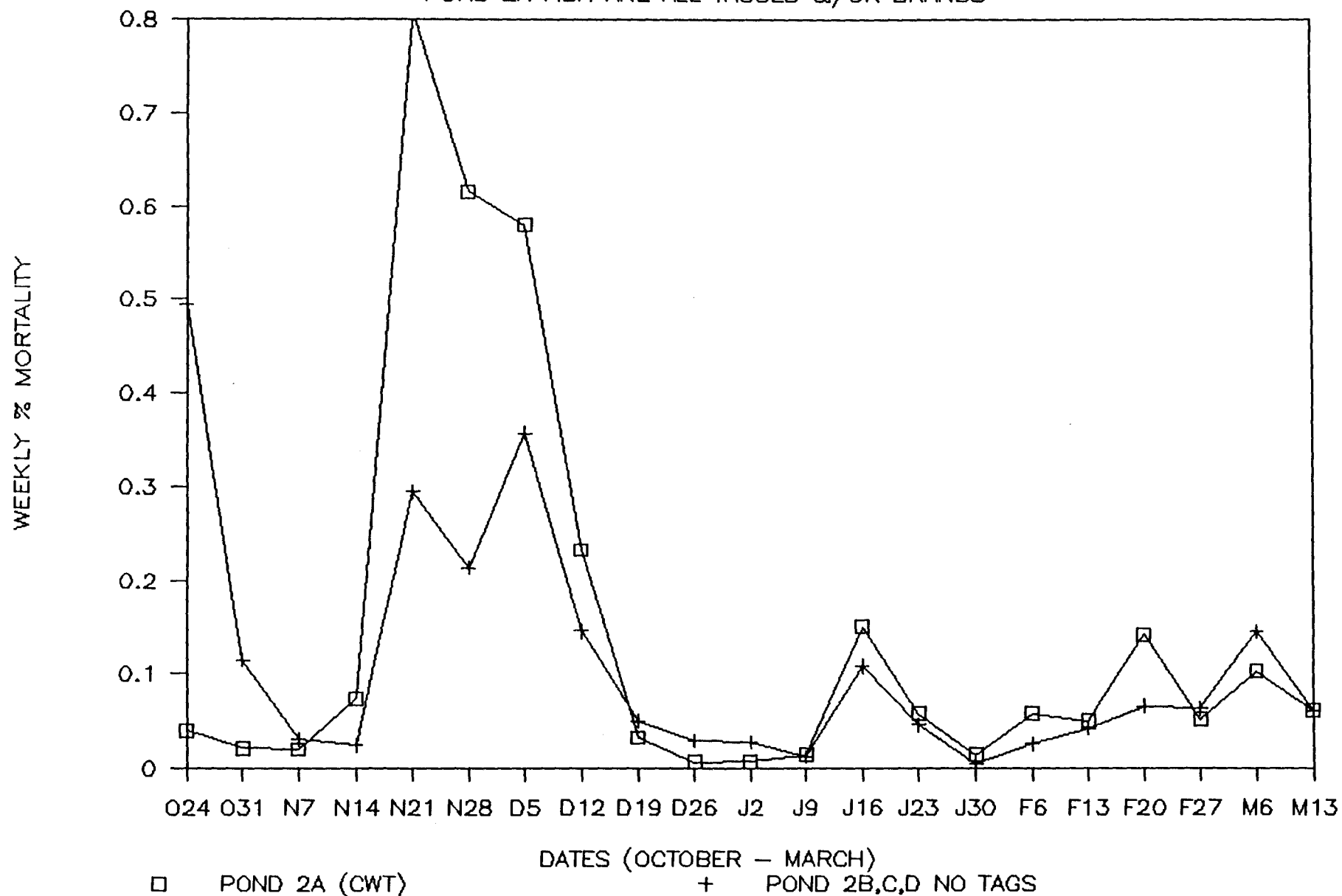


Figure 3. Post tagging mortality comparisons.

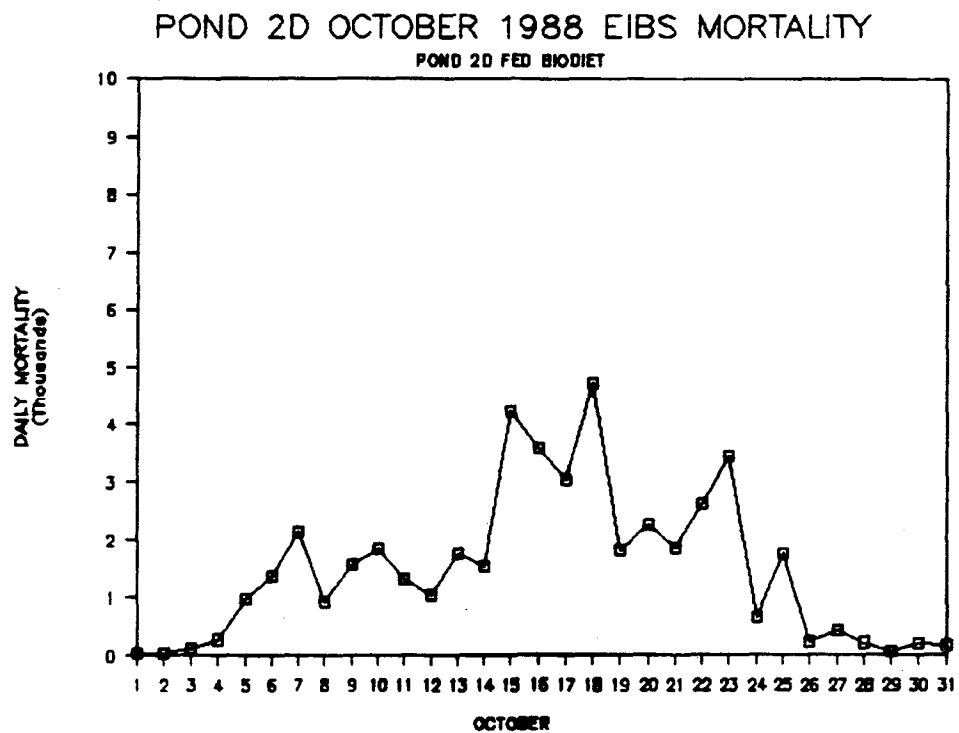
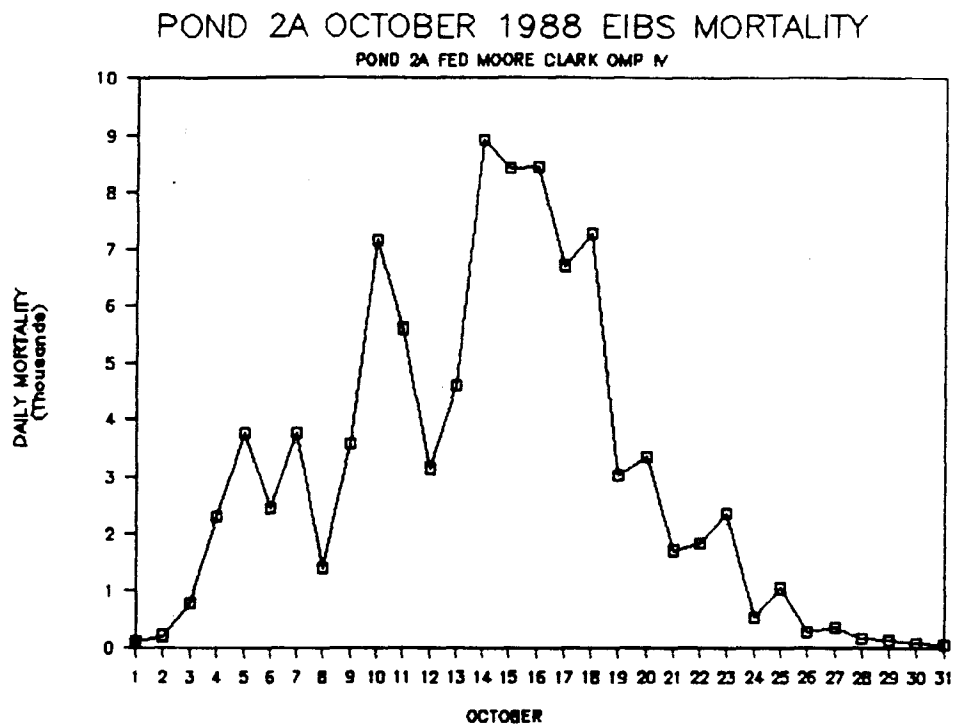


Figure 4. EIBS diet/mortality comparisons.

treatment was initiated on the entire Pond 2 system at a 140 ppm level, for one hour. While no increase in mortality occurred due to the treatment with formalin, it was felt that little or no results were attained in the reduction of secondary Saproleunia sp. infections. During the remainder of the brood year, it was estimated that mortality attributed to EIBS totaled nearly 150,000. It is apparent that further studies are necessary to manage the EIBS problem.

### **Bacterial Gill Disease**

Bacterial gill disease (BGD), as a result of bacteria Aeromonas pseudomonas, was responsible for mortalities totaling nearly 35,000 during July/August, 1988 from the Pond 1 system (Figure 5). Due to water reuse from the raceway system, Pond 1 had a higher level of settled fecal and organic material. This extra enrichment may have provided the basis for this gill disease outbreak.

These fish were taken off feed for approximately 10 days and treated with benzalkonium chloride at a 1.5 ppm level for 1 hour, for four treatments. Mortality numbers subsided by August 12, even though water temperatures ranged between 55 and 60 degrees F. for the remainder of August. It is anticipated that upcoming modifications to the Pond 1 system will minimize the potential of future BGD.

### **Miscellaneous Fish Health Problems**

During the 1987 Brood Year, all adult chinook were treated were treated with malachite green three times per week at a 1 ppm/ 1 hour level. This was done in both the HP-1 and HP-2 adult systems from June 1 through August 15, 1987 to control fungus. Sodium sulfite was used immediately following each treatment to decolorize the malachite green.

Other minor problems associated with otters, ducks, and kingfishers occurred during the 1987 Brood Year, but caused no significant mortality numbers.

### **FISH MARKING/CWT DATA**

In October of 1988, a portion of the 1987 brood inventory was marked in accordance with the U.S./Canada treaty. These fish will serve as one of the indicators of Idaho's contribution to the ocean harvest. Coded wire tags and some freeze brands were used during this project. Also, in March 1989, passively induced transponders (PIT tags) were used for a smolt plant below Hells Canyon Dam on the Snake River. Specific tag/release data is presented in Table 9.

# POND 1 BACTERIAL GILL DISEASE EPIZOOTIC

RAPID RIVER HATCHERY 1988

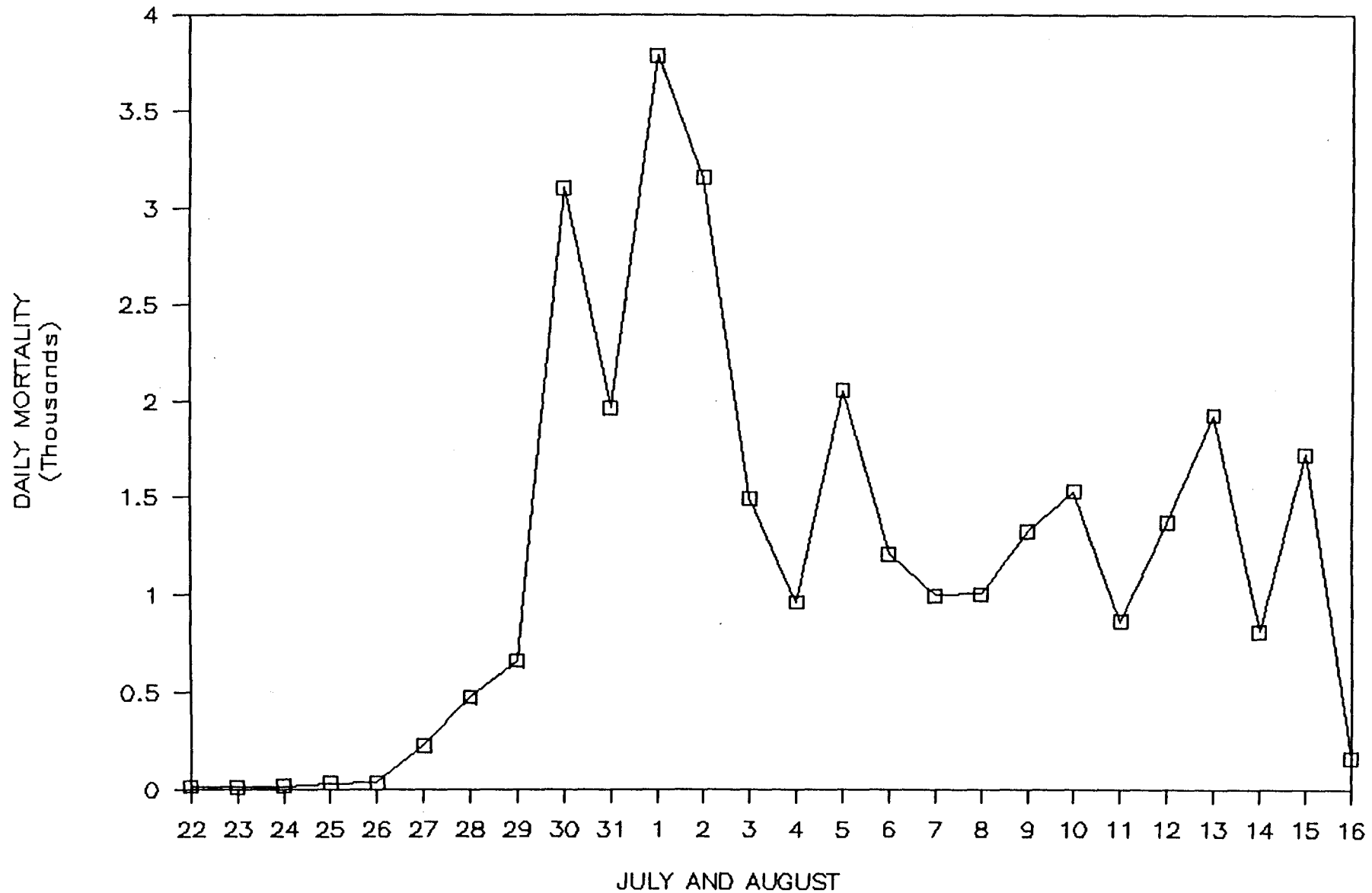


Figure 5. Bacterial gill disease mortality data.

Table 9. Marking/release summary, Brood Year 1987.

Date released	Tag type	Tag code	Tags released	Site released
03/15-30/89	CWT	10/31/47	51,985	Rapid River
03/15-30/89	CWT	10/31/48	51,197	Rapid River
03/15-30/89	CWT	10/31/49	50,843	Rapid River
03/15-30/89	CWT	10/31/50	53,151	Rapid River
03/15-30/89	CWT	10/31/51	53,419	Rapid River
03/15-30/89	CWT	10/31/52	52,993	Rapid River
03/15-30/89	CWT & FB	10/31/52 LD7H - 1	17,030	Rapid River
03/15-30/89	CWT & FB	10/31/52 LD7H - 3	16,970	Rapid River
03/15-30/89	CWT & FB	10/31/52 LA7H - 1	16,034	Rapid River
03/15-30/89	FB	La7H - 3	9,516	Rapid River
03/21/89	PIT	Unknown	2,904	Snake River

TABLE9



## FISH DISTRIBUTION

### Fingerling Releases

During May and June 1988, approximately 1.7 million fingerlings surplus to Rapid River Hatchery were outplanted to Clearwater and Salmon River tributaries. Specific plant data is presented in Table 10.

Table 10. Fingerling releases, Brood Year, 1987.

Date	Plant site	Number Planted	Fish/lb	Length in
SALMON RIVER DRAINAGE				
05/04/88	L. Salmon River	30,000	294	2.18
06/01/88	Yankee Fork	<u>50,100</u>	185	2.54
Subtotal		80,100		
CLEARWATER DRAINAGE				
05/05/88	Lolo Creek	103,800	294	2.18
05/05/88	Eldorado Creek	53,200	294	2.18
05/10/88	Crooked Fk Creek	137,800	380	2.02
05/10/88	Hopeful Creek	62,200	380	2.02
05/11/88	White Sand Creek	127,800	361	2.05
05/11/88	Big Flat Creek	72,200	361	2.05
05/12/88	American River	113,800	256	2.28
05/12/88	Newsome Creek	112,100	256	2.28
05/13/88	Meadow Creek	100,100	256	2.28
05/13/88	Crooked River	150,000	258	2.28
05/16/88	Crooked River	50,100	258	2.28
05/16/88	Red River	50,100	258	2.28
06/02/88	Brushy Fork	102,000	185	2.54
06/03/88	Brushy Fork	100,000	185	2.54
06/10/88	Ten Mile Creek	150,100	226	2.37
06/14/88	White Sand Creek	<u>100,200</u>	136	2.79
Subtotal		1,585,500		
TOTAL FINGERLING PLANTS		1,665,600		

### Smolt Releases

Volitional smolt releases from Rapid River Hatchery began on March 15, 1989, at which time most fish averaged 20 per pound (Table 11). Between March 15 and March 29, it was estimated, by visual observation, that approximately 400,000 fish had migrated out of the rearing ponds.

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Table 11. Rearing densities at time of smolt release, March 15, 1989.

Pond	Inflow	Millions of fish	Size per pound	Density index	Flow index
1	12.7 cfs	1.1	21.16	.16	1.76
2A	7.1 cfs	.3	22.35	.13	.89
2B	7.1 cfs	.5	25.70	.19	1.15
2C	6.4 cfs	.5	20.00	.22	1.51
2D	6.4 cfs	.5	20.30	.23	1.71

From March 21 to March 23, IPC transport tankers planted 500,000 smolts in the Snake River, directly below Hells Canyon Dam. All remaining Rapid River smolts were flushed from the rearing ponds directly into Rapid River on March 30, 1989. Plant site and number data is presented in Table 12.

Table 12. Smolt releases, Brood Year 1987.

Date	Plant site	Number planted	Number/pound
SNAKE RIVER			
03/21/89	Below Hells Canyon Dam	200,000	20.0
03/22/89	Below Hells Canyon Dam	251,000	20.0
03/23/89	Below Hells Canyon Dam	<u>49,000</u>	20.0
TOTAL		500,000	
RAPID RIVER			
03/15/89	Volitional Release	459,200	23.0
03/29/89			
03/30/89	Remaining fish forced out of ponds.	<u>1,860,300</u>	21.7
TOTAL		2,319,000	
HATCHERY TOTAL		2,819,500	

#### ACKNOWLEDGEMENTS

The crew at Rapid River Hatchery would like to thank Larry Wimer and the entire fisheries staff at Idaho Power Company for their support and assistance in helping us improve the hatchery facility. We would like to thank the staff from the Idaho Fish and Game hatcheries for helping us take eggs during the spawning season. We would also like to thank our local Conservation Officer, Eldon Anglen, for helping with enforcement problems at the hatchery and helping the hatchery personnel when high water conditions threaten the hatchery intake structure. We would also like to thank Scott Foott for doing disease diagnostic work at the hatchery and contributing some useful ideas that will help us reduce disease problems at the hatchery.

## **APPENDICES**

APPEN1

Appendix 1. Returns of spring chinook to Rapid River Hatchery, survival to spawn, and enumeration of eggs, 1964-1986.

Return near	Snake R. return (adults)	Rapid R. return (adults)	Rapid R. return (lacks)	Percent prespawn mortality	Females spawned	Eggs/ female	Number of eggs taken
1964	349			16	182	4,874	887,000
1965	408			21	133	4,541	604,000
1966	1,511			18	621	3,697	2,296,000
1967	974		1,039	11	581	3,537	2,055,000
1968	351	3,416	740	2	1,809	3,671	6,540,000
1969	672	2,817	1,043	8	1,415	3,655	5,151,697
1970		6,470	887	10	3,520	4,136	14,560,280
1971		3,357	1,754	19	1,722	3,507	6,038,785
1972		12,310	943	15	3,825	3,941	15,072,604
1973		17,054	286	37	3,454	3,912	13,510,465
1974		3,457	538	27	1,756	3,924	6,890,186
1975		4,428	573	7	2,184	3,894	8,503,606
1976		6,342	1,765	15	3,055	3,762	11,492,878
1977		7,767	437	11	3,781	3,745	14,160,330
1978		5,735	34	21	2,350	4,266	10,026,888
1979		3,054	350	31	1,141	4,950	5,648,722
1980		1,528	432	30	543	3,235	1,756,827
1981		3,087	176	7	1,666	3,675	6,122,273
1982		3,646	30	11	1,883	3,973	7,482,330
1983		1,864	94	15	859	4,015	3,449,471
1984		1,705	651	7	821	3,807	3,125,911
1985		6,376	351	8	2,962	3,741	11,082,369*
1986		6,546	177	34	2,451	4,355	10,673,138
1987		3,808	210	33	1,133	4,379	4,961,765

\*Volumetric displacement method total = 11,535,461.

Appendix 2. Summary of spring chinook returns to Rapid River by brood year.

Brood year	Year released	Number released	3-year olds	Year returned	4-year olds	Year returned	5-year olds	Year returned	Total brood year return	Percent return from plant
<b>1964</b>	<b>1966</b>	588,000	1,039	<b>1967</b>	3,422	<b>1968</b>	197	<b>1969</b>	<b>4,658</b>	0.80
<b>1965</b>	<b>1967</b>	<b>479,267</b>	740	<b>1968</b>	2,620	<b>1969</b>	<b>874</b>	1970	<b>4,234</b>	0.89
<b>1966</b>	<b>1968</b>	1,460,150	1,043	<b>1969</b>	<b>5,596</b>	1970	<b>364</b>	1971	7,003	0.48
<b>1967</b>	<b>1969</b>	900,192	887	1970	2,992	1971	1,544	1972	<b>5,416</b>	0.60
<b>1968</b>	1970	3,172,000	1,754	1971	10,766	1972	4,403	<b>1973</b>	16,923	0.53
<b>1969</b>	1971	2,718,720	<b>943</b>	1972	<b>12,65</b>	1973	1,759	<b>1974</b>	<b>15,356</b>	0.56
1970	1972	2,809,200	<b>285</b>	<b>1973</b>	1,698	1974	<b>386</b>	1975	2,370	0.08
1971	<b>1973</b>	2,908,425	<b>538</b>	<b>1974</b>	4,206	1975	1,120	<b>1976</b>	5,864	0.20
1972	<b>1974</b>	2,707,917	573	1975	5,222	<b>1976</b>	<b>634</b>	1977	6,429	0.24
1973	<b>1975</b>	3,373,700	1,765	<b>1976</b>	7,110	1977	1,845	1978	10,720	0.32
<b>1974</b>	<b>1976</b>	<b>3,358,940</b>	437	1977	3,890	1978	2,413	<b>1979</b>	6,740	0.20
1975	1977	2,921,172	34	1978	<b>598</b>	<b>1979</b>	<b>46</b>	<b>1980</b>	<b>678</b>	0.02
<b>1976</b>	1978	2,413,678	350	<b>1979</b>	1,482	1980	<b>146</b>	1981	1,978	0.08
1977	<b>1979</b>	<b>2,866,993</b>	432	1980	3,068	1981	557	1982	4,057	0.14
1978	1980	2,604,823	176	1981	3,089	1982	1,206	1983	4,291	0.16
<b>1979</b>	1981	2,372,607	30	1982	838	1983	<b>356</b>	1984	1,224	0.05
1980	1982	1,473,733	<b>94</b>	1983	1,349	<b>1984</b>	<b>199</b>	<b>1985</b>	1,642	0.11
1981	1983	2,998,103	<b>651</b>	<b>1984</b>	6,177	<b>1985</b>	1,456	<b>1986</b>	8,284	0.28
1982	1984	3,246,197	351	<b>1985</b>	5,090	<b>1986</b>	1,155	1987	<b>6,596</b>	0.20
<b>1983</b>	1985	2,491,238	177	<b>1986</b>	<b>2,444</b>	1987	1,557	<b>1988</b>	4,178	0.17
<b>1984</b>	<b>1986</b>	1,594,688	210	1987		<b>1988</b>		<b>1989</b>		
<b>1985</b>	<b>1987</b>	2,836,400	172	<b>1988</b>		<b>1989</b>		<b>1990</b>		
<b>1986</b>	<b>1988</b>	2,630,200		<b>1989</b>		<b>1990</b>		<b>1991</b>		
1987	<b>1989</b>	2,319,500		<b>1990</b>		<b>1991</b>		<b>1992</b>		

Appendix 3. Rapid River Hatchery feed use data for brood  
year 1987.

Feed size	Feed type & manufacturer	Cost/ pound	Pounds	Cost (including sales tax)
<u>Moore Clark</u>				
Starter	OMP IV	0.46	350	169.05
1/32	OMP IV	0.46	1,900	917.70
3/64	OMP IV	0.46	2,700	1304.10
1/16	OMP IV	0.46	1,000	483.00
3/32	OMP II	0.38	11,000	4,389.00
1/8	OMP II	0.38	12,832	5,119.97
Totals			29,782	12,382.82
<u>BioProducts</u>				
#2	BioDiet	0.74	704	547.01
#3	BioDiet	0.74	2,992	2,324.78
1.0 mm	BioDiet	0.53	2,700	1,502.55
1.3 mm	BioDiet	0.55	6,700	3,869.25
1.5 mm	BioMoist	0.53	11,500	6,399.75
2.5 mm	BioMoist	0.37	40,500	15,734.25
3.0 mm	BioMoist	0.37	117,825	45,775.01
Totals			182,92	76,152.60
Hatchery Totals			212,703	88,535.42

Appendix 4. Summary of eggs, fry plants, and smolts planted from  
Rapid River Hatchery 1964-1988.

Brood year	Eggs taken	Egg, fry plants & site	Smolt plants & site
1964	887,000	None	580,000-Rapid R.
1965	604,000	None	480,000-Rapid R.
1966	2,296,000	None	1,460,000-Rapid R.
1967	2,055,000	None	900,000-Rapid R.
1968	6,540,000	757,376 eggs, Clear- water hatching channels.	3,172,000-Rapid R.
1969	5,171,697	497,000 eggs sent to Dworshak NFH to start Kooskia NFH.	2,718,720-Rapid R.
1970	14,560,280	4,417,454 eggs sent to Sweetwater for eyeing 2,224 eggs, Kooskia NFH. 526,516 eggs, Hayden Ck. Hatchery. 2,473,983 eggs, Clear- water Hat. Channels. 4,607,736 eggs at Rapid River Hatchery  200,520 fry, Lemhi River 353,970 fry, Decker Pond 100,000 fry, Sandpoint H.	2,809,200-Rapid R. 91,800-Lochsa R.
1971	6,038,785	600,000 eggs, Hayden Creek Hatchery 53,562 fry, Lemhi R. 104,300 fry Red River 29,800 fry Ten Mi. Ck. 44,700 fry American R. 14,900 fry Papoose Ck. 59,600 fry Brushy Ck. 44,700 fry Fish Ck. 14,900 fry Post Office Ck. 44,700 fry Squaw Ck. (Lochsa) 61,500 fry Lochsa R. 60,000 fry Ten Mi. Ck. 200,880 fry Sandpoint Hatch. 401,305 fry Decker Pond  5,256,662 eggs, Sweetwater Eyeing Station. 3,012,358 eggs, Hayden	197,303-SF Clear- water 2,809,200- Rapid R.
1972	15,072,604		2,707,917-Rapid R.

APPEN4



Appendix 4. Continued.

Brood year	Eggs taken	Egg, fry plant & site	Smolt plant & site
		Creek Hatchery. 1,293,592 eggs, Red R. Hatching Channel 4,878,017 eggs, Rapid River Hatchery	
1973	13,510,464	3,915,900 eggs, Sweet- water Eyeing Station 1,295,424 eggs, Hayden R. Creek Hatchery 104,760 eggs, Hagerman Hatchery. 502,200 eggs, Crooked R. Hatching Channel. 702,000 eggs, Kooskia NFH 806,400 eggs, Hayden Ck. Hatchery 504,000 eggs, Minnesota for walleye trade. 210,734 fry, Sandpoint Hatch. 206,360 fry Kooskia Hatch. 88,480 fry Ten Mi. Ck. 18,200 fry Newsome Ck. 633,000 fry Lemhi River 10,428 fry Capehorn Ck.	117,000-SF Clear- water 3,373,700-Rapid
1974	6,890,186	809,400 eggs, Hayden Ck. Hatchery. 407,012 eggs, Indian Ck. Hatching Channel 5,203,273 eggs, Rapid R. Hatchery 203,500 fry, Sandpoint Hatchery 21,840 fry, Capehorn Ck. 59,962 fry, Red River 30,750 fry, Newsome Ck. 10,250 fry, Ten Mi. Ck. 1,140,300 fry, Lemhi R.	205,700-SF Clear- water 3,564,640-Rapid R.
1975	8,503,606	2,363,200 eggs, Sweet- water Eyeing Station 252,200 eggs, Mullan Hatchery 255,000 eggs, Hayden	249,750-SF Clear- water 3,170,922-Rapid R.

APPEN4

Appendix 4. Continued.

Brood year	Eggs taken	Egg, fry plant & site	Smolt plant & site
1975		Creek Hatchery 280,659 eggs, Indian Ck. Hatching Channel 4,906,492 eggs, Rapid R. Hatchery 34,000 fry, Ten Mi. Ck. 156,000 fry, Lemhi R. 65,960 fry, SF Clearwater 412,800 fry, Decker Pond 209,950 fry, Sandpoint Hatchery 36,143 fry, Bear Valley Ck. (Hayden Ck. drainage)	
1976	11,492,878	1,161,608 eggs, Mullan Hatchery 2,937,994 eggs, Sweet- water Eyeing Station 261,900 eggs, Hayden Ck. Hatchery 261,900 eggs, Sandpoint Hatchery 1,267,208 eggs, Mackay Hatchery 5,009,482 eggs, Rapid River Hatchery 47,008 fry, University of Idaho, Fish Coop. 311,850 fry, Mackay Hatchery 104,500 fry, Lolo Ck. 501,600 fry, Red River Pond 80,600 fry, SF Clear- water River	2,413,678-Rapid R.
1977	14,160,330	2,633,400 eggs, Sweet- water Eyeing Station 2,287,800 eggs, Kooskia Nat'l Fish Hatchery 2,689,000 eggs, Mullan Hatchery 288,000 eggs, Hayden Creek Hatchery 20,700 eggs, University	44,373-Newsome Ck. 156,362-White Sands 3,018,448-Rapid R.

APPEN4

Appendix 4. Continued.

Brood year	Eggs taken	Egg, fry plant & site	Smolt plant & site
1977		of Idaho 1,007,340 eggs, Crooked River Hatching Channel 5,098,587 eggs, Rapid River 723,000 fry, Mackay Hatchery 50,800 fry, Decker Pond 200,025 fry, Red R. Pond 265,600 fry, Lemhi River	
1978	10,026,888	767,322 eggs, Hayden Ck. Hatchery 970,728 eggs, Mackay Hatchery 1,540,282 eggs, Sweet- water Eyeing Station 706,936 eggs, Dworshak NFH 38,160 eggs, University of Idaho 10,864 eggs, University of Idaho (Hayden Ck.) 1,250,010 eggs, Crooked R. Hatching Channel 249,969 eggs, Sweetwater Eyeing Station 232,500 fry, Red River Pond 10,000 fry, Ten Mile Ck.	157,440-White Sands Creek 2,811,593-Rapid R.
1979	5,646,722	806,400 eggs, Hayden Ck. 330,880 eggs, Dworshak 293,249 fry, Red River Pond	1,001,700-Snake R. 2,375,715-Rapid R.
1980	1,756,827	None	1,473,733-Rapid R.
1981	6,122,273	608,384 eggs, Pahsimeroi Hatchery 256,608 eggs, Oxbow Hatchery (Oregon) 449,280 eggs, Dworshak NFH 4,409,036 eggs kept at Rapid River	250,020-Snake R. 2,998,103-Rapid R.

APPEN4

Appendix 4. Continued.

Brood near	Eggs taken	Eggs, fry plants & site	Smolt plants & site
1982	7,420,450	493,346 eggs, Looking- glass Hatchery (Ore.) 1,332,000 eggs, Pahsimeroi Hatchery 375,028 eggs, Dworshak Nat'l Fish Hatchery 125,055 eggs, Hagerman Nat'l Fish Hatchery 4,614,863 eggs kept at Rapid River Hatchery 306,000 fry, Red River Pond	500,850-Snake R. 3,246,197-Rapid R.
1983	3,449,471	None	437,360-Snake R. 2,491,238-Rapid R.
1984	3,125,911(RR) 217,181(Red R)	152,000 fry, Red River	140,000-Snake R. 136,000-Red R. 1,871,488-Rapid R.
1985	11,535,461	497,520 eggs, Oregon 3,668,000 eggs,Dworshak Nat'l Fish Hatchery 2,450,907 eggs, Sawtooth Fish Hatchery 100,590 fry, Boulder Ck. 349,650 fry, Crooked River 200,158 fry, Eldorado Ck. 55,123 fry, Hopeful Ck. 144,443 fry, Crooked Fk. 70,282 fry, White Sands Ck. 49,437 fry, Ten Mile Ck. 102,282 fry, Newsome Ck. 115,352 fry, Brushy Fk.	103,000-Snake R. 2,939,400-Rapid R.
1986	10,673,138	2,368,400 eggs, Dworshak Nat'l Fish Hatchery 712,905 eggs, Sawtooth Hatchery 7,591,833 eggs kept at Rapid River Hatchery 348,600 fry, Crooked Fk. 202,400 fry, White Sand Creek 98,000 fry, Big Flat Ck. 238,900 fry, Red River Pond	400,600-Snake R. 2,630,200-Rapid R.

APPEN4

Appendix 4. Continued.

Brood year	Eggs taken	Egg, fry plant & site	Smolt plant & site
1987	5,656,145	30,000 fry, Little Salmon River 103,800 fry, Lolo Ck. 53,200 fry, Eldorado Ck. 137,800 fry, Crooked Fk. Creek 62,200 fry, Hopeful Ck. 108,300 fry, White Sand Creek 72,200 fry, Big Flat Ck. 19,500 fry, White Sand Creek 113,800 fry, American River 112,100 fry, Newsome Ck. 100,100 fry, Meadow Ck. 200,100 fry, Crooked R. 50,100 fry, Red River 50,100 fry, Yankee Fk. 202,000 fry, Brushy Fk. 150,100 fry, Ten Mile Ck. 100,200 fry, White Sand Ck.	500,000-Snake R. 2,319,500-Rapid R.

Submitted b y :

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A p p r o v e d b y :

IDAHO DEPARTMENT OF FISH AND GAME



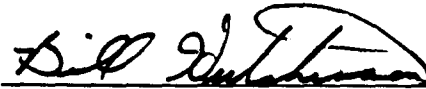
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